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HARROW-COLCHESTER SOUTH WATER SUPPLY SYSTEM

DRINKING WATER SURVEILLANCE PROGRAM

ANNUAL REPORT - 1986

MAY, 1987

Ontario
Ministry of the Environment

J. Bishop, Director
Water Resources Branch

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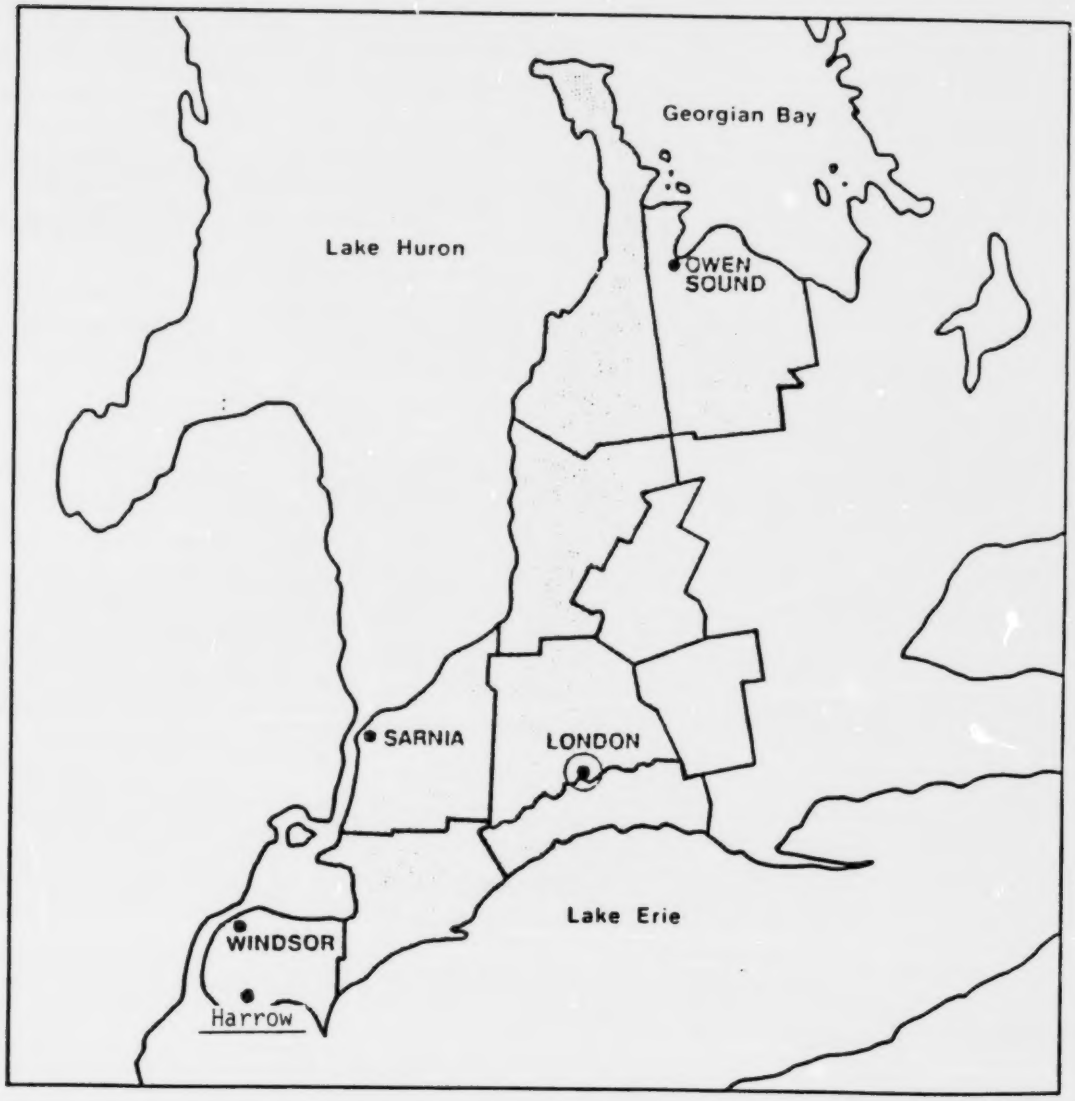
ONTARIO MINISTRY OF THE ENVIRONMENT

Southwestern Region



HARROW-COLCHESTER SOUTH WATER SUPPLY SYSTEM

Location:	P.O. Box 909 Harrow, Ontario N6R 1G0 (519-738-3038)
Source:	Lake Erie
Design Capacity:	10.229 1000 M3/day
Operation:	Ministry of the Environment
Plant Superintendent:	G. E. Johnston
Ministry Region:	Southwestern Region London Regional Office 985 Adelaide Street South London, Ontario N6E 1V3 (519-661-2200)
Municipalities Served:	Town of Harrow (2,281) Colchester Township (1,047)
Treatment Type:	Physical and chemical treatment consisting of coagulation, flocculation, clarification (upflow clarifier) and filtration, with disinfection as well as activated carbon adsorption.
Chemicals Used:	Adsorption - powdered activated carbon Coagulation - alum liquid with polyelectrolyte Post chlorination - chlorine

HARROW-COLCHESTER SOUTH WATER SUPPLY SYSTEM

EXECUTIVE SUMMARY
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The Harrow-Colchester South Water Supply System was sampled 5 times in 1986; results are given for raw and treated samples.

The parameters analyzed fall into several categories: physical parameters and general chemistry, bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides.

The discussion of results focuses on health-related parameters found in treated water:

(a) **Organic Substances**

Analysis was carried out for approximately 110 organic compounds. The only volatile compounds found, trihalomethanes (THMs) were always present in treated waters; the highest level recorded for total THMs was 41 ug/L.

None of the pesticides analyzed for was found.

No chlorophenolic or chloroaromatic compounds were found.

(b) **Other Parameters**

Of the physical, general chemistry and microbiological parameters and metals analyzed, for which there are health-related ODWO*, none exceeded the objectives, in treated water.

The results of these analyses are consistent with those obtained in other areas of the Great Lakes.

The treated water from the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

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* The Ontario Drinking Water Objectives, revised 1983.

HARROW-COLCHESTER SOUTH WATER SUPPLY SYSTEM

SUMMARY TABLE OF RESULTS
DRINKING WATER SURVEILLANCE PROGRAM, 1986

The Harrow-Colchester South Water Supply System was sampled 5 times in 1986.

PARAMETER CATEGORY	TYPE OF SAMPLE RAW	TREATED*
1. GENERAL CHEMISTRY - includes anions such as sulphate, field analyses such as chlorine residual and physical parameters such as colour.		
Total number of parameters in category: 21		
- Total number of analyses completed	90	90
- Total number of positive results	86	68
- **Number of times guidelines exceeded**	**N/A**	**0**
2. METALS - includes metals such as copper and lead.		
Total number of parameters in category: 24		
- Total number of analyses completed	106	106
- Total number of positive results	47	40
- **Number of times guidelines exceeded**	**N/A**	**0**
3. BACTERIOLOGY - includes bacteria such as coliforms.		
Total number of parameters in category: 5		
- Total number of analyses completed	20	20
- Total number of positive results	16	4
- **Number of times guidelines exceeded**	**N/A**	**0**
4. VOLATILES - includes compounds such as benzene and toluene; also included in this category are trihalomethanes (5 parameters), acknowledged to be produced during water treatment.		
Total number of parameters in category: 29		
- Total number of analyses completed	141	141
- Total number of positive results	0	20
- **Number of times guidelines exceeded**	**N/A**	**0**
5. PESTICIDES -		
Total number of parameters possible in category: 65		
- Total number of analyses completed	148	148
- Total number of positive results	0	0
- **Number of times guidelines exceeded**	**N/A**	**0**
6. CHLOROAROMATICS AND CHLOROPHENOLS - includes a range of chlorinated organic compounds.		
Total number of parameters possible in category: 19		
- Total number of analyses completed	71	71
- Total number of positive results	0	0
- **Number of times guidelines exceeded**	**N/A**	**0**

* Total number of analyses completed will not always equal the number of parameters analyzed for multiplied by number of times the supply was sampled, because of accidents during shipping or analyses or analytical difficulties.

** Ontario Drinking Water Objective.

DRINKING WATER SURVEILLANCE PROGRAM

The Drinking Water Surveillance Program (DWSP) for Ontario is a computerized drinking water information system. The objectives of this program are to provide:

- immediate, reliable, current information on drinking water quality,
- a flagging mechanism for 'Objective' exceedence,
- a definition of contaminant levels and trends,
- a comprehensive background for remedial action,
- a framework for assessment of new contaminants,
- an indication of treatment efficiency of plant processes.

Program

The DWSP began in April 1986 and is designed to eventually include all municipal water supplies in Ontario. Water supply locations have been prioritized for surveillance, based primarily on such criteria as population density, probability of contamination and geographical location.

Once the data base becomes established, an assessment of monitoring requirements for the future will be made; monitoring will be continued at the initial locations at an appropriate level and further locations will be phased on to the program as resources permit. It is

estimated that after 4 years of operation, the program will be monitoring 90 locations.

A major goal of the program is to collect valid water quality data, in context with plant operation characteristics in the plant at the time of sampling.

Assessments are carried out at all locations prior to sampling in order to acquire full plant process and distribution system details, and to designate (and retrofit if necessary) all sampling systems and locations.

Samples are taken of the raw (ambient water quality) and treated water at the treatment plants, and also in the distribution systems. In order to determine possible effects of distribution on water quality, both standing and flowing water in old and new sections of the distribution system are sampled. Sampling is carried out by Ministry of the Environment (MOE) Regional staff and/or Municipal personnel who have been trained in the applicable procedures. Comprehensive sampling kits and documented sampling procedures are made available to samplers. This ensures that samples are taken and shipped according to standard protocols and that field testing will supply reliable data. All analyses are carried out using approved documented procedures.

Data Reporting Mechanism

Final analytical results are usually received by the DWSP reporting system within 6 weeks of the time of sampling. At this time, printouts of the completed analyses are sent to the MOE District Officer and the appropriate MOE regional office, and are also retained by the DWSP co-ordinator. The DWSP is able to monitor analysis results and assess trends. Should the level of

a contaminant exceed a health-related Ontario Drinking Water Objective, action is required as outlined in the publication, Ontario Drinking Water Objectives.* The DWSP issues an "Action Alert" which notifies appropriate MOE and health authorities, and supplies a history of the occurrence of the contaminant in the water supply system concerned.

Parameters Analyzed

About one hundred and forty (140) different parameters are routinely measured on DWSP covering microbiological, organic and inorganic substances of concern, as well as process parameters.

Parameters included in the program are based on the following criteria:

- probability that the substance has the potential to cause problems (health-related or aesthetic);
- probability of occurrence in ambient water;
- availability of routine analytical and sampling methods for monitoring and control purposes;
- feasibility of control.

The range of parameters includes those having Ontario Drinking Water Objectives (ODWO), World Health Organization Drinking Water Guideline values, or other

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* Ontario Drinking Water Objectives, revised 1983, published by the Ontario Ministry of the Environment.

jurisdiction's drinking water objectives (e.g. State of California) as well as compounds of concern to other agencies such as the International Joint Commission, and U.S. Environmental Protection Agency.

The parameters monitored routinely during 1986 are shown in Table 1; this table also includes available guidelines which are appropriate for drinking water, and the analytical detection limit (the lowest concentration that can be detected by laboratory analysis) for each parameter.

Analyses for additional pesticides may be included on certain sampling dates; such additional pesticides are selected from the list shown in Table 1A. These analyses may be done on a seasonal basis, in response to an identified concern or because of a potential for occurrence in certain locations. Seasonal analyses for specified additional pesticides are normally carried out at times corresponding to maximal agricultural use or run-off periods, i.e. in spring and fall seasons.

Drinking Water Guidelines

The Ministry of the Environment published a revised edition of "Ontario Drinking Water Objectives" in 1983.

The primary purpose of drinking water objectives is the protection of the health of the public consuming the water. Aesthetic considerations may also provide a basis for drinking water objectives, since the water should be pleasant to drink. The control of such aspects of water quality as hardness, corrosiveness, etc. is also important. The limits set are considered to outline the minimum requirements necessary to fulfill the above objectives, and may be either health-related or related to aesthetic and other considerations.

Because this survey covered such a large number of parameters, many of them did not have an ODWO. In order to be able to compare data results to health guidelines, it was necessary to refer to objectives and guidelines developed by other jurisdictions.

The footnotes to Table 1 indicate the sources and derivation of the various guidelines.

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
CHEMISTRY:			Barium	1 mg/L	0.001 mg/L
Conductivity	-	0.01 UMHO/CM	Boron	5 mg/L	0.02 mg/L
			Beryllium	-	0.001 mg/L
Hardness	-	0.5 mg/L	Cyanide	0.2 mg/L	0.001 mg/L
Calcium	-	0.1 mg/L	Cadmium	0.005 mg/L	0.0003 mg/L
Magnesium	-	0.05 mg/L	Cobalt	-	0.001 mg/L
Sodium	-	0.1 mg/L	Chromium	0.05 mg/L	0.001 mg/L
Alkalinity		0.2 mg/L	Copper	1 mg/L	0.001 mg/L
pH	-	-	Mercury	1 µg/L	0.01 µg/L
Fluoride	2.4 mg/L	0.01 mg/L	Molybdenum	-	0.001 mg/L
Chloride	250 mg/L	0.2 mg/L	Nickel	-	0.002 mg/L
Residue total (solids)	-	1 mg/L	Lead	0.05 mg/L	0.003 mg/L
Turbidity	1 FTU	.01 FTU	Selenium	0.01 mg/L	0.001 mg/L
Phosphorus	-	0.002 mg/L	Strontium	-	0.001 mg/L
Phosphates	-	0.0005 mg/L	Vanadium	-	0.001 mg/L
Nitrogen Total Kjeldahl	0.15 mg/L*	0.1 mg/L	Zinc	5 mg/L	0.001 mg/L
Ammonium Total	-	0.05 mg/L			
Colour	5 TCU	0.5 TCU	BACTERIOLOGY (RAW ONLY):		
Nitrates Total	10 mg/L as N	.05 mg/L	Total Coliform MF	-	0
			Total Coliform MF BKGD	-	0
Nitrite	1 mg/L as N	0.0005 mg/L	Fecal Coliform	-	0
			Standard Plate Count MF	-	0
METALS:			(TREATED ONLY):		
Uranium	0.02 mg/L(t)	0.002 mg/L‡	Present/Absent (P/A) Test	Absent	Absent
Iron	0.3 mg/L	0.002 mg/L	Total Coliform MF BKGD	-	0
Manganese	0.05 mg/L	0.001 mg/L	Fecal Coliform	0	0
Aluminum	-	0.003 mg/L	Standard Plate Count MF	<500 orgs/mL	0
Arsenic	0.05 mg/L	0.001 mg/L			

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
VOLATILES:			CHLOROAROMATICS:		
1,1-Dichloroethylene	0.3 µg/L(h)	1.0 µg/l	Hexachloroethane	19000 ng/L(e)	1 ng/L
Dichloromethane	40 µg/L(c)	5 µg/L	1,3,5-Trichlorobenzene	10000 ng/L(y)	5 ng/L
TRS-1,2-Dichloroethylene	-	1 µg/L	1,2,4-Trichlorobenzene	15000 ng/L(y)	5 ng/L
1,1-Dichloroethane	-	1 µg/L	Hexachlorobutadiene	4500 ng/L(e)	1 ng/L
Chloroform	350 µg/L++	1 µg/L	1,2,3-Trichlorobenzene	10000 ng/L(y)	5 ng/L
1,1,1-Trichloroethane	1000 µg/L(c)	1 µg/L	2,4,5-Trichlorotoluene	-	5 ng/L
1,2-Dichloroethane	10 µg/L(h)	1 µg/L	2,3,6-Trichlorotoluene	-	5 ng/L
Carbon Tetrachloride	3 µg/L(h)	1 µg/L	1,2,3,5-Tetrachloro-		
Benzene	10 µg/L(h)	1 µg/L	benzene	-	1 ng/L
1,2-Dichloropropane	-	1 µg/L	1,2,4,5-Tetrachloro-		
Trichloroethylene	30 µg/L(h)	1 µg/L	benzene	38000 ng/L(e)	1 ng/L
Dichlorobromomethane	350 µg/L++	1 µg/L	2,6,A-Trichlorotoluene	-	5 ng/L
Toluene	100 µg/L(c)	1 µg/L	1,2,3,4-Tetrachloro-		
1,1,2-Trichloroethane	6 µg/L(e)	1 µg/L	benzene	-	1 ng/L
Chlorodibromomethane	350 µg/L++	1 µg/L	Pentachlorobenzene	74000 ng/L(e)	1 ng/L
Tetrachloroethylene	10 µg/L(h)	1 µg/L	Total PCB's	3000 ng/L(t)	20 ng/L
Chlorobenzene	100-300 ng/L(h)*	1 ng/L			
Trifluorochlorotoluene	-	1 µg/L	PESTICIDES:		
Ethylbenzene	1400 µg/L(e)	1 µg/L	Hexachlorobenzene	10 ng/L(h)	1 ng/L
Ethylene Dibromide	0.02 µg/L(x)	1 µg/L	Heptachlor	3000 ng/L+++	1 ng/L
P-Xylene	620 µg/L(c)	1 µg/L	Aldrin	700 ng/L**	1 ng/L
M-Xylene	620 µg/L(c)	1 µg/L	PP-DDE	d	1 ng/L
O-Xylene	620 µg/L(c)	1 µg/L	Mirex	-	5 ng/L
Total Trihalomethanes	350 µg/L++	3 µg/L	Alpha BHC	700 ng/L(c)	1 ng/L
Bromoform	350 µg/L++	1 µg/L	Beta BHC	300 ng/L(c)	1 ng/L
1,1,2,2-Tetrachloroethane	1.7 µg/L(e)	1 µg/L	Gamma BHC (Lindane)	4000 ng/L	1 ng/L
1,4-Dichlorobenzene	400 µg/L(e)	1 µg/L	Alpha Chlordane	7000 ng/L***	2 ng/L
1,3-Dichlorobenzene	400 µg/L(e)	1 µg/L	Gamma Chlordane	7000 ng/L***	2 ng/L
1,2-Dichlorobenzene	400 µg/L(e)	1 µg/L	Oxychlordane	-	2 ng/L

TABLE 1: DRINKING WATER SURVEILLANCE PROGRAM, PARAMETERS ANALYSED (cont'd)

PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit	PARAMETER CATEGORY	Objective Guideline (1)	Detection Limit
Pesticides (cont'd)					
OP-DDT	30000 ng/L(d)	5 ng/L			
PP-DDD	d	5 ng/L			
PP-DDT	d	5 ng/L			
Methoxychlor	100000 ng/L	5 ng/L			
Heptachlor Epoxide	3000 ng/L+++	1 ng/L			
Endosulfan 1	74000 ng/L(ea)	2 ng/L			
Dieldrin	700 ng/L**	2 ng/L			
Endrin	200 ng/L	4 ng/L			
Endosulfan 2	74000 ng/L(ea)	4 ng/L			
Endosulfan Sulphate	-	4 ng/L			
Octachlorostyrene	-	1 ng/L			
Toxaphene	5000 ng/L	PA(xx)			

Footnotes:

(l) = Ontario Drinking Water Objectives (ODWO) for drinking water, unless noted.

(t) = ODWO Interim maximum acceptable concentration (IMAC) for drinking water.

(c) = California State Department of Health Action Level for drinking water.

(d) = ODWO for DDT (contains other isomers such as OPDDT and PPDDT).

(e) = US EPA ambient guideline; guideline levels when it is assumed that untreated water and fish and shellfish are consumed from the same body of water.

(ea) = United States Environmental Protection Agency (US EPA) ambient level for endosulfan (contains other isomers).

(h) = World Health Organization (WHO) guideline for drinking water.

(h)* = World Health Organization (WHO) Odour Threshold for drinking water.

(x) = State of Florida, maximum contaminant level for drinking water.

(xx) = the presence of toxaphene is detected in scan used; positive samples would be quantified by special additional analysis.

(y) = New York State (Taste and Odour) proposed drinking water guideline.

++ = total Trihalomethanes.

+++ = combined total; Heptachlor and Heptachlor Epoxide.

* = total Kjeldahl Nitrogen minus Ammonia Nitrogen.

** = total of Aldrin and Dieldrin.

*** = Chlordane is a mixture of alpha and gamma isomers.

‡ = Analysis changed to mass spectrometry method in mid-1986, detection limit 0.0001 mg/L.

TABLE 1A: DRINKING WATER SURVEILLANCE PROGRAM SPECIAL PESTICIDES

Dicamba	Reldan
2,4-D	Ronnel
2,4-DB	Carbofuran
2,4-DP	Propoxur
2,4,5-T	IPC
Silvex (2,4,5-TP)	Aminocarb
Picloram	CIPC
2,4,6-Trichlorophenol	Eptam
2,4,5-Trichlorophenol	Benonyl
2,3,4-Trichlorophenol	Bux
2,3,5,6-Tetrachlorophenol	Diallate
2,3,4,5-Tetrachlorophenol	Sevin
Pentachlorophenol	Sutan
Diazinon	Propazine
Dichlorvos	Atrazine
Dursban	Simazine
Ethion	Sencor (metribuzin)
Guthion	Bladex (Cyanazine)
Malathion	Prometone
Mevinphos	Ametryne
Methyl Parathion	Prometryne
Methyl Trithion	Atratone
Parathion	Alachlor
Phorate (Thimet)	Metolachlor

RESULTS AND DISCUSSION

The parameters analyzed fall into several categories: physical parameters and general chemistry (chemistry), bacterial parameters, metals, and organic substances including volatile and chloroaromatic substances and pesticides. Many of the substances analyzed for are naturally-occurring or treatment by-products.

The results of analysis of raw and treated water samples are shown in Tables 2 and 3. Table 2 shows the categories of parameters analyzed, as well as the total number of analyses which were completed in each category for both raw and treated water samples and the total number of positive results which were obtained. Table 3 lists the sampling dates and the numerical values for each parameter for which analysis produced a positive (quantifiable) result.

The Harrow-Colchester South Water Supply System was sampled five times in 1986.

(a) Non Organic Substances

There are 154 positive results of 180 reported analyses for physical parameters, such as pH and temperature and general chemistry tests. The results of these tests are used as an indication of the analytical validity and integrity of the samples, the general characteristics of the water, and as a guide to making an assessment of the treatment process; they may also indicate whether any changes occur during the time elapsing between sampling and actual analysis.

Positive bacteriological results were obtained for 20 analyses out of a total number reported

of 40. These bacterial tests include those for species of paramount importance from a public health point of view, and those which assess the general bacteriological quality and characteristics of the water; by this means, a measure is obtained of the overall efficiency of water treatment processes. Positive results were obtained for treated water samples for standard plate count (a measure of the total number of bacteria in a water sample). The highest count was 5 organisms per mL; the ODWO recommend that treated water not exceed 500 organisms per mL for standard plate count.

Analyses of 212 tests for metals in the water samples were reported; of these 87 were positive results. Metals can occur naturally and most are generally regarded as being ubiquitous. However, some may be present in water as a result of industrial or other discharges. A small number of metals have public health significance.

Of those parameters discussed above for which there are ODWO, none exceeded the Objectives. Nor did the levels exceed any guidelines for drinking water set by other jurisdictions, such as the U.S. Environmental Protection Agency (US EPA), the World Health Organization (WHO) and Health & Welfare, Canada (H&W, Canada). Furthermore, the results of these analyses are consistent with those obtained in other areas of the Great Lakes.

(b) **Organic Substances**

Of a total of 282 analyses for volatile organic compounds, only 20 were positive; these were from treated water samples and were all due to the presence of trihalomethanes.

Trihalomethanes (THMs) are acknowledged to be produced during the water treatment process and will almost always only occur in treated waters. Trihalomethanes are comprised mainly of chloroform, chlorodibromomethane and dichlorobromomethane with bromoform occurring occasionally. Results are reported for the individual compounds as well as for their sum, which is expressed as total trihalomethanes (total THM). The ODWO for total THM is 350 ug/L; this level was not exceeded in any of the water samples included in this report, the highest level recorded being 41 ug/L on June 23, 1986.

Two hundred and thirty two (232) tests were carried out for twenty three different pesticides; none was found above trace levels. Seven special pesticides (dicamba, 2,4-D propionic acid, 2,4-D, Silvex, 2,4,5-T, 2,4-D butyric acid and picloram) were analyzed for in both raw and treated water on one occasion (April 21, 1986); this analysis is carried out only once or twice a year at each supply, on a seasonal basis, to correspond to the use and/or loss of such pesticides on agricultural land. Eight additional pesticides (propazine, atrazine, simazine, Sencor, Bladex, prometone, ametryne and prometryne) were analyzed for monthly as of April 21, 1986, with the exception of June 23, 1986. Alachlor, metolachlor and atratone were additional parameters analyzed on December 15, 1986. None of the above mentioned pesticides was found in either raw or treated water.

Of the six chlorophenolic compounds (2,4,6-trichlorophenol, 2,4,5-trichlorophenol, 2,3,4-trichlorophenol, 2,3,5,6-tetrachlorophenol, 2,3,4,5-tetrachlorophenol, pentachlorophenol) that

were analyzed for on April 21, 1986; none was found.

One hundred and thirty (130) tests were conducted for chloroaromatics; there were no positive results.

CONCLUSIONS

The data reveal that for metals, inorganic ions, and bacterial parameters, raw water values are frequently in the detectable range; levels of metals and inorganics are also found in treated water. The levels of metals, inorganic compounds, and bacteria are consistent with those found in other water supplies in the province.

For the organic compounds, most are below detection levels, even though the most sophisticated equipment available was employed in the chemical analysis.

ODWO have not been established for some of the compounds analysed; for these few compounds, use was made of appropriate guidelines set by other agencies, such as the World Health Organization, the US Environmental Protection Agency, Health and Welfare Canada or other agencies. None of these guidelines was exceeded.

The treated water at the supply did not exceed any known health-related guidelines for organic substances applicable to drinking water.

TABLE 2

HARROW-COLCHESTER SOUTH WATER SUPPLY SYSTEM

	PARAMETER GROUP	TYPE OF SAMPLE RAW	TREATED
1.	GENERAL CHEMISTRY		
	- Total samples	90	90
	- Total positives	86	68
2.	METALS		
	- Total samples	106	106
	- Total positives	47	40
3.	BACTERIOLOGY		
	- Total samples	20	20
	- Total positives	16	4
4.	VOLATILES		
	- Total samples	141	141
	- Total positives	0	20
5.	PESTICIDES		
	- Total samples	116	116
	- Total positives	0	0
6.	CHLOROAROMATICS		
	- Total samples	65	65
	- Total positives	0	0
7.	CHLOROPHENOLS		
	- Total samples	6	6
	- Total positives	0	0
8.	SPECIAL PESTICIDES		
	- Total samples	32	32
	- Total positives	0	0

Table 3

HARROW-COLCHESTER WATER TREATMENT PLANT DWSP RESULTS

02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/02/17	86/04/21	86/05/26	86/06/23	86/12/15
ALKALINITY	MG/L-CAC	R	90.600	88.200	90.500	90.800	91.800
		T	80.600	78.300	82.000	81.800	80.400
ALUMINUM	MG/L-AL	R	.086	.440	.220	.280	.710
		T	.048	.044	.100	.094	.035
BARIUM	MG/L-BA	R	.013	.015	.015	.015	.018
		T	.014	.014	.016	.015	.018
BORON	MG/L-BO	R					.030
		T	.020			.020	.030
CALCIUM	MG/L-CA	R	33.000	31.200	32.800	29.400	32.200
		T	32.000	31.300	33.200	29.500	33.100
CHLORIDE	MG/L-CL	R	17.000	15.550	15.000	11.500	19.500
		T	16.200	16.950	15.000	13.000	20.500
COLOUR	HZU	R	6.000	3.000	4.500	6.000	5.000
		T	2.000				
CONDUCTIVITY	UMHO/CM	R	276.00	255.00	265.00		284.00
		T	274.00	262.00	268.00	259.00	295.00
CHROMIUM	MG/L-CR	R	.002			.001	.001
		T	.002				
COPPER	MG/L-CU	R	.069	.039	.099	.072	.020
		T	.004	.001	.004		.001
FECAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R				6.000	214.00
		T					

Table 3 (cont'd)

HARROW-COLCHESTER WATER TREATMENT PLANT DWSP RESULTS

PARAMETERS	UNITS		SAMPLE DATE 86/02/17	86/04/21	86/05/26	86/06/23	86/12/15						
IRON	MG/L-FE	R	.082	.530	.260	.380	.800						
		T	.011		.004		.004						
FLUORIDE	MG/L-F	R	.110	.090	.100	.090	.120						
		T	.090	.070	.100	.080	.080						
FIELD COMBINED CHLORINE RESIDUAL	MG/L-CL	R											
		T	.090	.100	.150		.100						
FIELD FREE CHLORINE RESIDUAL	MG/L-CL	R											
		T	.580	.500	.350	.580	.680						
FIELD TOTAL CHLORINE RESIDUAL	MG/L-CL	R											
		T	.690	.600	.500	.670	.780						
FIELD PH		R	8.400	9.300	8.450	8.500	7.300						
		T	7.600	7.800	7.600	7.900	7.400						
FIELD TEMPERATURE	DEG.C	R	1.000	8.000	15.000	20.000	1.000						
		T	2.000	8.500	16.000	20.500	2.000						
FIELD TURBIDITY	FTU	R	1.800	12.000	5.400	10.000	21.000						
		T	.130	.110	.120	.110	.120						
HARDNESS	MG/L-CAC	R	118.00	109.50	114.00	105.00	114.00						
		T	113.00	109.50	115.00	106.50	115.00						
STANDARD PLATE COUNT MEMBRANE FILT.	CT/ML	R	68.000	65.000	1900.0		470.00						
		T	2.000		5.000	1.000	1.000						
MERCURY	UG/L-HG	R				.010	.010						
		T	.010				.010						
MAGNESIUM	MG/L-MG	R	8.700	7.750	7.750	7.650	8.150						
		T	8.000	7.600	7.800	7.950	7.900						

Table 3 (cont'd)

HARROW-COLCHESTER WATER TREATMENT PLANT OWSP RESULTS

02/11/9

PARAMETERS	UNITS		SAMPLE DATE 86/02/17	86/04/21	86/05/26	86/06/23	96/12/15						
MANGANESE	MG/L-MN	R	.004	.011	.009	.013	.016						
		T	.003	.002	.003	.004	.003						
MOLYBDENUM	MG/L-MB	R											
		T			.001								
SODIUM	MG/L-NA	R	9.500	9.000	8.300	6.300	12.100						
		T	9.000	8.900	8.200	6.900	11.600						
NICKEL	MG/L-NI	R	.001				.002						
		T	.001										
AMMONIUM TOTAL	MG/L-N	R		.022	.022	.040	.018						
		T		.012	.008	.028							
NITRITE	MG/L-N	R	.002	.005	.010	.022	.011						
		T			.002	.002							
TOTAL NITRATES	MG/L-N	R	.450	.475	.415	375	.675						
		T	.465	.475	.400	.370	.640						
NITROGEN TOTAL KJELDAHL	MG/L-N	R	.180	.270	.290	.290	.230						
		T	.090	.080	.090	.100							
PH		R	8.140	8.350	8.310	8.130	8.260						
		T	7.420	7.990	7.930	7.790	8.190						
PHOSPHORUS FIL REACT	MG/L-P	R		.003		.008	.005						
		T	.003										
PHOSPHORUS TOTAL	MG/L-P	R	.010	.030	.021	.035	.045						
		T		.001									

Table 3 (cont'd)

HARROW-COLCHESTER WATER TREATMENT PLANT DWSP RESULTS 02/17/87

PARAMETERS	UNITS		SAMPLE DATE 86/02/17	86/04/21	86/05/26	86/06/23	86/12/15						
TOTAL SOLIDS	MG/L	R	179.00 CRO	195.00	189.00	204.00	193.00						
		T	178.00 CRO	170.00 CRO	174.00 CRO	162.00 CRO	165.00						
STRONTIUM	MG/L-SR	R	.110	.100	.110	.098	.120						
		T	.120	.100	.110	.098	.130						
TOTAL COLIFORM MEMBRANE FILTRATION	CT/100ML	R	16.000	14.000		85.000 A3C	1900.0						
		T											
TOTAL COLIFORM BACKGROUND MF	CT/100ML	R	60.000	102.00	190000	8100.0	1200.0						
		T											
TURBIDITY	FTU	R	3.400	18.900	9.700	17.100	31.000						
		T					.170						
URANIUM	UG/L-U	R					.440						
		T											
VANADIUM	MG/L-V	R	.003			.001	.001						
		T	.002										
CHLOROFORM	UG/L	R											
		T	15.000	9.000	17.000	20.000	14.000						
DICHLOROBROMOMETHANE	UG/L	R											
		T	10.000	6.000	10.000	12.000	9.000						
CHLORODIBROMOMETHANE	UG/L	R											
		T	14.000	11.000	6.000	9.000	5.000						
TOTAL TRIHALOMETHANES	UG/L	R											
		T	39.000	25.000	33.000	41.000	28.000						
ZINC	MG/L-ZN	R	.009	.010	.006	.010	.001						
		T	.003	.004	.002	.003							